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Microplastics In The Final Ocean Frontier

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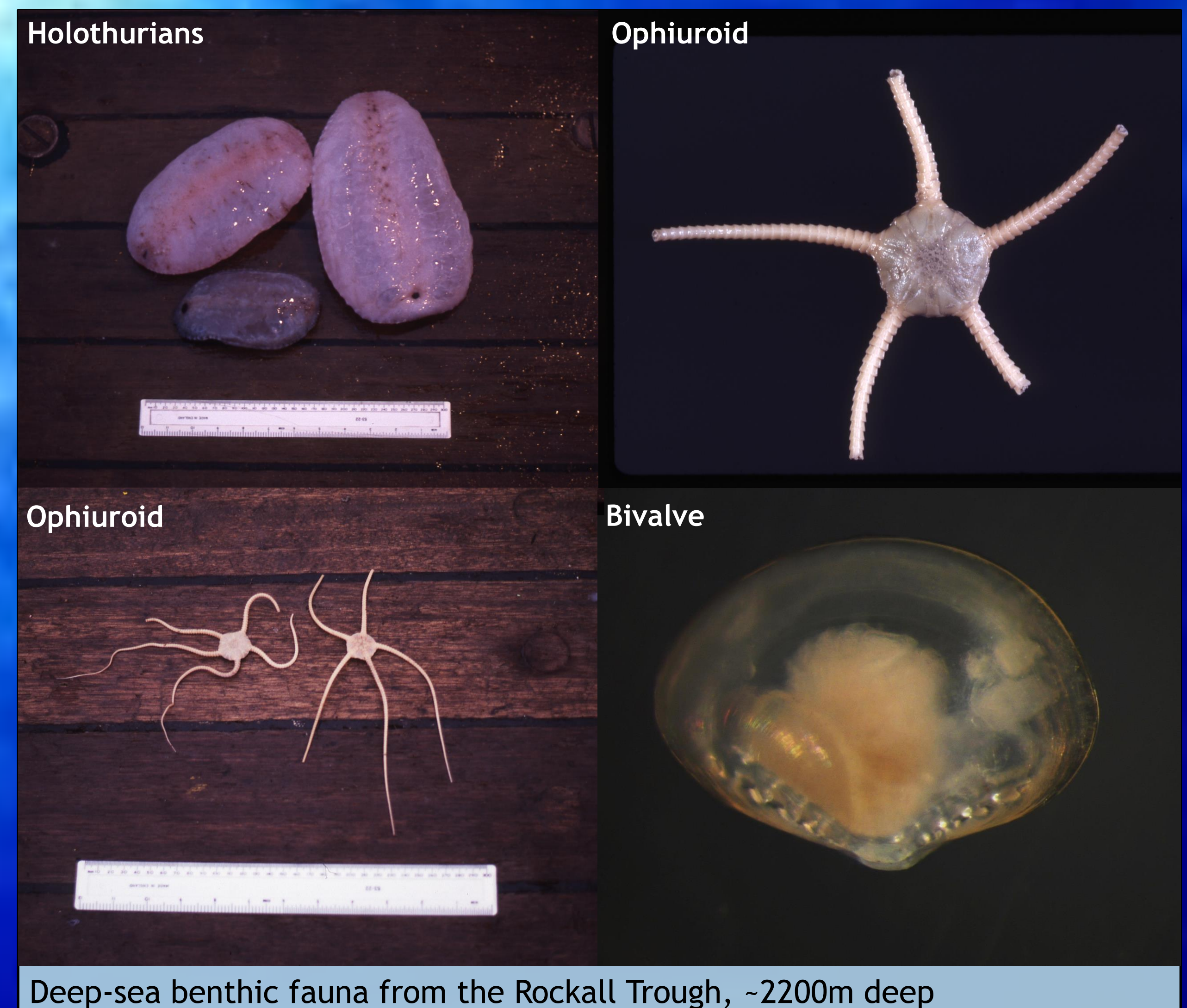
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Introduction

The deep-sea is classified as the portion of the ocean deeper than 200m off the continental slope (Gage & Tyler, 1991). This area covers over half of the Earth's surface and supports an incredibly rich diversity of species (Thurber et al. 2014). This remote region has largely remained out of sight out of mind, however the deep-sea is vulnerable to a number of anthropogenic impacts. Macroplastics are recorded extensively in the deep-sea (e.g. Schlining et al. 2013). Concern is mounting regarding microplastics as these small persistent plastics represent one of the greatest threats to ecosystem functioning and services.

Worldwide distribution of microplastics is patchy and current estimates suggest lower quantities in surface waters than expected (Eriksen et al. 2014). Microplastics have been reported in deep-sea sediments (Woodall et al. 2014), hypothesising the deep-sea may be a sink for this pollutant. The ultimate fate of marine microplastics is not well understood; while numerous species are reported to ingest microplastics, currently no studies have considered whether the deep-sea benthic community is also susceptible.



Deep-sea benthic fauna from the Rockall Trough, ~2200m deep

Aims

My study presents first of its kind research, focussing on a long-term time series of deep-sea fauna collected from the Rockall Trough dating back to the mid-1970s. I aim to address the following questions:

- Are deep-sea benthic fauna ingesting microplastics?
- Can we detect when microplastics arrived in the deep-sea?
- What is the timescale and potential vertical transport routes of microplastics to the deep-sea?



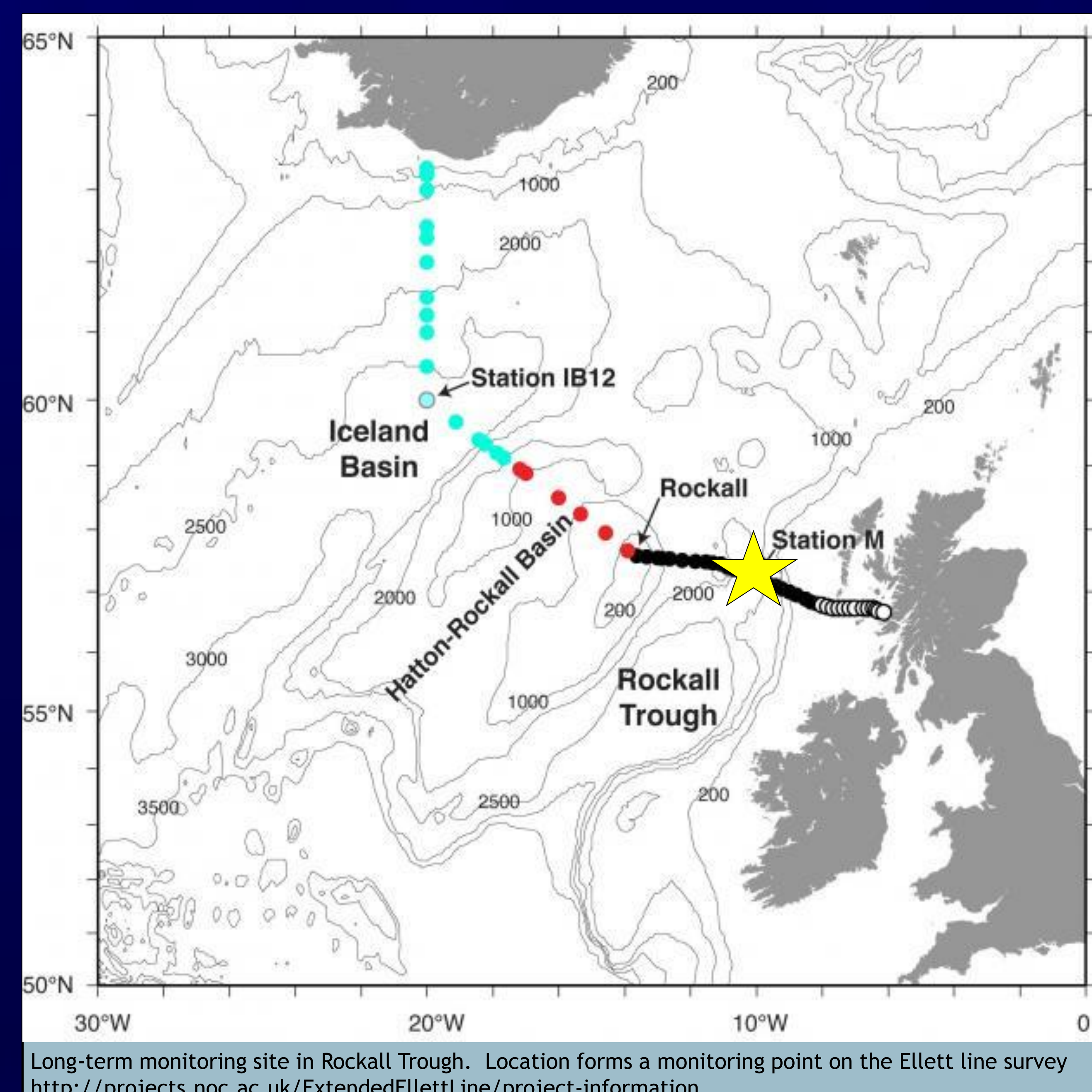
Example of the diversity of deep-sea benthic macrofauna obtained from one trawl from the Rockall Trough, ~2200m deep



Epibenthic sled with net trailing behind on deck of research vessel, used to collect deep-sea fauna samples

Method

- Rapid and efficient **enzymatic digestion** of deep-sea benthic macrofauna
 - Focus on echinoderms displaying a range of feeding strategies
- **Identification & quantification** of ingested microplastics
 - Visual & ATR-FTIR spectrometry
 - Characterise microplastics
 - Do quantities vary with feeding mechanism?
- **Examining historical specimens:** Are there decadal trends in ingested microplastics quantities?
- **Modelling distribution & vertical transport routes** of microplastics to Rockall Trough



Long-term monitoring site in Rockall Trough. Location forms a monitoring point on the Ellett line survey <http://projects.noc.ac.uk/ExtendedEllettLine/project-information>